

REMARKS

Claims 1, 2, 5, 7, 9 and 10 are rejected, and claims 3, 4, 6, 8 and 11-25 are withdrawn from consideration as being directed to a non-elected invention.

Review and reconsideration on the merits are requested.

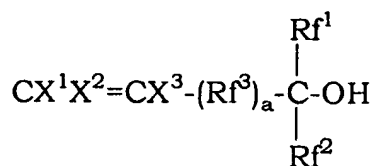
Claims 1, 2, 5, 7, 9 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,444,148 to Adelman or JP 5-238988 to Inomata et al. (JP '988) each individually in view of U.S. Patent No. 5,986,150 to Araki et al. for reasons of record.

Applicants traverse, and respectfully request the Examiner to reconsider for the following reasons.

A. The Present Invention:

The present invention is directed to a fluorine-containing ethylenic monomer having hydroxyl group represented by formula (1a).

(1a)



wherein X^1 and X^2 are the same or different and each is H or F; X^3 is H, F, Cl or CF_3 (at least one of X^1 , X^2 and X^3 is H and X^1 , X^2 and X^3 are not H at the same time); Rf^1 and Rf^2 are the same or different and each is a perfluoroalkyl group; Rf^3 is a fluorine-containing alkylene group or a fluorine-containing alkylene group having ether bond; and a is 0 or 1.

The elected Species is Species (2), where $a = 1$, $\text{X}^1=\text{X}^2=\text{H}$; and $\text{X}^3=\text{F}$.

B. Difference in Structure between the Fluorine-Containing Ethylenic Monomer of the Invention and the Prior Art:

As acknowledged by the Examiner, the perfluorinated tertiary alcohol-containing monomers of Adelman and JP '988 differ from the claimed fluorine-containing ethylenic monomer having hydroxyl in that the carbon atom at the 3-position (relative to the double bond) is unsubstituted, whereas, in the elected species where $a=1$, Rf^3 is a fluorine-containing alkylene group having 1 to 40 carbon atoms or a fluorine-containing alkylene group having ether bond.

C. No Interchangeability:

The Examiner cited Araki et al as teaching bivalent groups with either perfluorinated alkylene or perfluorinated oxyalkylene relative to the 3-position corresponding to bivalent Rf^3 of present claim 1. The monomer of formula (I) at column 6, line 19 of Araki et al has a fluorinated 3-position, but is missing a tertiary fluoroalcohol group. The compound at column 7, line 40 has a tertiary fluoroalcohol group, but is missing fluorinated Rf^3 at the 3-position.

The Examiner further maintained that Araki et al teaches that $CH_2=CH-Y-$ and $CH_2=CF-Y-$ type moieties are functionally equivalent, where the linking group Y can be fluorinated or non-fluorinated, citing various passages at columns 6, 13 and 15.

Because all of the references are said to involve preparing similar functional fluoropolymers having the same type of hydroxyl group, the reason for rejection was that it would have been obvious to synthetically modify the moieties $CH_2=CH-CH_2-$ and $CH_2=CH-(CH_2)_n-$ in the monomers of Adelman or JP '988 by replacing with a moiety

$\text{CH}_2=\text{CF-Rf-}$ as taught by Araki et al., with the expectation of obtaining functional copolymers having good affinity with other heat-resisting thermal plastic resins.

However, Applicants respectfully dispute the Examiner conclusion of interchangeability.

The “Y” group referred to by the Examiner, at the 3-position, is always fluorinated C as shown in claim 1 of Araki et al.

On the other hand, the hemi-acetal compound of JP-A-143888/1975 at column 7, lines 36-49 (where the carbon at the 3-position is not substituted) is not a compound of Araki et al. This is because the fluorine-containing olefin of Araki et al. (claim 1) has X^2 being a primary alcohol group or an epoxide-containing moiety. Consequently, there is no disclosure linking $\text{CH}_2=\text{CF-Y-}$ with the compound of JP-A-143888/1975.

From yet a different perspective, Araki et al. would never have been patentable if $\text{CH}_2=\text{CRCH}_2\text{O-}$ of the compound of JP '888 at column 7, lines 36-49 of Araki et al. were interchangeable with $\text{CH}_2=\text{CF-CF}_2\text{-}$ of the compound of Formula (I) at column 6, line 19 of Araki et al.

Thus, Araki et al. does not teach that $\text{CH}_2=\text{CH-Y-}$ and $\text{CH}_2=\text{CF-Y-}$ type moieties are functionally equivalent or interchangeable, and therefore also does not teach or suggest substitution of $\text{CH}_2=\text{CF-Rf-}$ in the corresponding portions of the compounds of Adelman or JP '988.

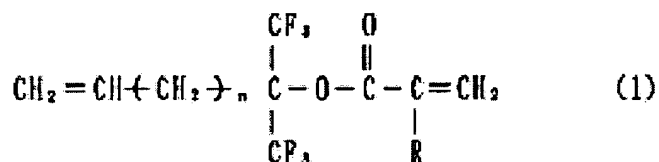
(i) **No Motivation to Combine Adelman and Araki et al.:**

The polyfluorinated tertiary alcohol monomer having $\text{CH}_2=\text{CH-CH}_2\text{-}$ unit according to Adelman is copolymerized to prepare a copolymer having enhanced compatibility with

acrylonitrile and dyeability by the presence of fluoroalcohol, but not by the presence of a CH=CF- unit. Without first consulting the disclosure in the present specification, Applicants cannot understand how one skilled in the art could substitute the CH₂=CF-Y- of Araki et al. (related to providing molded articles) for CH₂=CH-CH₂- in Adelman. There is no motivation to make such a modification from the viewpoint of the above-noted difference in objectives, or from the teaching of the prior art, or based on the knowledge of a skilled artisan.

(ii) No Motivation to Combine JP '988 and Araki et al.:

The objective of JP '988 is to provide a novel fluorine-containing organic compound represented by formula (1) reproduced below and having, in one molecule, acryloxly or methacryloxyl, vinyl and trifluoromethyl.



The object of JP '988 is to provide a compound useful for improving water repellency and also as an intermediate for carbon functional silanes by introducing trifluoromethyl.

Without first consulting the disclosure in the present specification, Applicants cannot understand how one skilled in the art could substitute the CH₂=CF-Y- of Araki et al. (related to providing molded articles) for CH₂=CH-(CH₂)_n- in the monomer of JP '988. As above with respect to Adelman et al., there is no motivation to make such modification from the viewpoint

of difference of objectives, or from the teachings of the prior art, or based on the knowledge of a skilled artisan.

That is, it is respectfully submitted that one of ordinary skill in the art could never arrive at the claimed invention based on the combination of Adelman et al. or JP '988 each in view of Araki et al., without first improperly consulting Applicants' specification.

D. Unexpected Results as a Basis for Patentability:

As discussed at page 1, lines 5-8 of the specification, the present invention relates to a novel fluorine-containing ethylenic monomer which has hydroxyl group or fluoroalkyl carbonyl group, and possesses good polymerizability, particularly radical polymerizability. As discussed at page 1, lines 15-20 of the specification, the fluorine-containing ethylenic monomer having hydroxyl of the present invention can be polymerized alone and can also be polymerized with other monomers, particularly fluorine-containing ethylenic monomers having no hydroxyl. Thus, hydroxyl having high acidity can be introduced into a fluorine-containing polymer.

Moreover, as discussed at page 2, lines 6-12 of the specification, as compared with conventional fluorine-containing polymers having hydroxyl and fluorine-containing polymers having other functional groups, in accordance with the invention, transparency (particularly transparency in vacuum ultraviolet region) and low refractive index can be maintained or improved while also enhancing affinity for insolubility in an aqueous medium, particularly an aqueous alkaline medium.

Moreover, a fluorine-containing polymer obtained by polymerizing the monomer has excellent optical characteristics and is useful as a base polymer for an antireflection film and a resist (page 94, lines 25-27 of the specification).

Experimental Example 3 at pages 87-89 of the specification evaluates solubility in a developing solution. Particularly, 10 % butyl acetate solutions of the fluorine-containing polymers obtained in Example 2 and Preparation Examples 2 to 4 were prepared and coated on a Si substrate to a thickness of 200 nm followed by drying. Solubility was evaluated after dipping the dried Si substrate in a tetramethyl ammonium hydroxide aqueous solution, the results of which are set forth in Table 1 at page 89 of the specification.

The first compound in Table 1 (reproduced below) is a compound of the invention, which is the combination of the $\text{CH}_2=\text{CF}-(\text{Rf}_3)_a-$ moiety with a tertiary fluoroalcohol. So is the third compound in Table 1. The compounds of the invention exhibited excellent solubility and the subject films were dissolved with no remaining film, evaluated as "O". On the other hand, the second compound $\text{CH}_2=\text{CFCF}_2\text{OCF}(\text{CF}_3)\text{CF}_2\text{OCF}(\text{CF}_3)\text{CH}_2\text{OH}$ in Table 1 is a compound representative of Araki ($\text{CH}_2=\text{CF}-\text{Rf}_3^a-$ moiety, but no tertiary fluoroalcohol group), and the fifth compound $\text{CH}_2=\text{CHCH}_2\text{C}(\text{CF}_3)_2\text{OH}$ in Table 1 is a compound representative of Adelman (tertiary fluoroalcohol, but no $\text{CH}_2=\text{CF}-\text{Rf}_3^a-$ moiety).

As shown in Table 1, the polymer of the second compound (Araki et al.) was not dissolved in the developing solution (evaluated as "X"), and a polymer of the fifth compound (Adelman) left a residue (evaluated as " Δ ") when treated with the developing solution. The

above-noted results (reproduced below) are unexpectedly superior over the prior art relied upon by the Examiner (combination of $\text{CH}_2=\text{CF}-\text{Rf}^3_{\text{a}}$ - moiety and tertiary fluoroalcohol group).

TABLE 1

Fluorine-containing ethylenic monomer having OH	Model structure	Monomer	ΔH Exp. Ex. 1	Measured pKa Exp. Ex. 2	Solubility of polymer in a developing solution Exp. Ex. 3
$\text{CH}_2=\text{CFCF}_2\text{OCFCF}_2\text{OCFCOH}$ $\quad \quad \quad \text{CF}_3 \quad \quad \text{CF}_3 \quad \text{C}_2\text{F}_5$	$\text{HCF}_2\text{OCFCOH}$ $\quad \quad \quad \text{CF}_3 \quad \text{C}_2\text{F}_5$	Ex. 1	-15.8	6.8	○ (Ex. 2)
$\text{CH}_2\text{CFCF}_2\text{OCFCF}_2\text{OCFCH}_2\text{OH}$ $\quad \quad \quad \text{CF}_3 \quad \quad \text{CF}_3$	$\text{HCF}_2\text{OCFCH}_2\text{OH}$ $\quad \quad \quad \text{CF}_3$	-	122.3	12.6	× (not dissolved) (Prep. Ex. 2)
$\text{CH}_2=\text{CFC}(\text{CF}_3)_2\text{OH}$	-	Ex. 4	38.7	8.0	○ (Ex. 5)
$\text{CF}_2=\text{CFC}(\text{CF}_3)_2\text{OH}$	-	Prep. Ex. 1	10.5	7.1	-
$\text{CH}_2=\text{CHCH}_2\text{C}(\text{CF}_3)_2\text{OH}$	-	-	76.2	9.6	△ (a residue found)

As discussed above, Applicants believe that Araki et al. does not teach interchangeability of $\text{CH}_2=\text{CH}-\text{Y}-$ and $\text{CH}_2=\text{CF}-\text{Y}-$ moieties, such that there is no motivation to combine $\text{CH}_2=\text{CF}-\text{Rf}-$ taught by Araki et al. with the fluorinated tertiary alcohol of either of the primary references. However, to the extent that the Examiner considers the references as establishing a *prima facie* case of obviousness, Applicants point to the above-noted results as set forth in Table 1 of their specification as demonstrating the unexpected superiority of their invention.

At page 6 of the final Office Action, the Examiner commented that the unexpected results or advantages of the invention "are not included at all inside the parent claims." However, there is no requirement to recite "unexpected results" relied upon as a basis for patentability. Also, in response to the Examiner's suggestion that Applicants "may need to show the 'criticality' why

only the tertiary claimed fluoroalcohol is used," the test data presented in Table 1 of the specification clearly shows criticality in the combination of the $\text{CH}_2=\text{CF}(\text{Rf}^3)\text{a-}$ moiety with a tertiary fluoroalcohol.

For the above reasons, it is respectfully submitted that the present claims are patentable over the cited prior art, and withdrawal of the foregoing rejection is respectfully requested.

Withdrawal of all rejections and allowance of claims 1-10 (Group I) is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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